

~~W. J. [Signature]~~
83285

Work Order ID 83285

April-16-12 2:29:03 PM

Item ID: D350-748-241TRN

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Item Name: Crosstube Turning Detail

Stop ***NS2***

Start Date: 16/04/2012 Start Qty: 1.00 ***1***

Cust Item ID:

Required Date: 30/04/2012 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Approvals: Process Plan: MLJ Date: 12/04/16 Tooling:

Run Start ***NR1***

QC: Date: SPC (Y/N):

Date:

Stop ***NR2***

Date:

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
----------	--------------

D350-748-241	F
--------------	---

100

0.00

100

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio FA647
2-Turn first side as per Folio FA647
3-File transition lines smooth.
FOLIO REV: _____
DWG REV: _____

1 0

MAN.L
12/04/22

110

QC1- Inspect dimensions to dimension sheet

0.00

110

QC

Memo

0.00

Quality Control

1 0

MAN.L
12/04/22

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

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Page 2

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Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
120		0.00							
120	MORI SEIKI CNC LATHE LARGE								
Mori Seiki	Memo	0.00							
Mori Seiki CNC Lathe Large	1-Turn second side as per Folio FA647 2- File transition lines smooth. 3-Scribe part # as per Dwg D350-748-241 FOLIO REV: _____ DWG REV: _____								
130		0.00							
130	QC1- Inspect dimensions to dimension sheet								
QC	Memo	0.00							
Quality Control									
140		0.00							
140	QC8- Inspect parts - second check								
QC	Memo	0.00							
Quality Control									

SEE ATTACHED

RTO

12/04/22

12-5-3

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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NOTE: Date & initial all entries

W/O: 83285		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D350-748-241 TRN PAR #: Fault Category: X- Lube NCR: Yes No DQA: AK Date: 12/06/28
 Resolution: Disposition: Use on ~~work~~ Rework QA: N/C Closed: AK Date: 12/7/5

NCR: 12-1548		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
12.05.02	100	Cuff machined to Ø 2.140 along 0.080" long area at end of cuff	CP 12.05.02 ØS1042	Acceptable. GRIND SMOOTH	JK 12-05-02	S 17/05/02	CP 12.05.02 ØS1042	S 17/05/02
		Small step at end of cuff from Ras tool. R.C. adjust on tool						

NOTE: Date & initial all entries

Work Order ID 83285***83285***

Page 3

April-16-12 2:29:03 PM

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N900040100Setup Start ***NS1***

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Stop ***NS2***

Start Date: 16/04/2012 Start Qty: 1.00

1

Cust Item ID:

Required Date: 30/04/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

150

0.00

150

Large Fab

Crosstubes

Memo

0.00

Crosstubes

Grind machining marks.

Rm
12-5-3

160

Outsource process - Heat Treat

0.00

160

Outsource1

Memo

0.00

Outsource process - Heat Treat

Issue P/O:

Heat Treat to min 180 KSI As per Dwg D350-748-241

Sand Blast tube after Heat Treat

Possible Supplier: Vae Aero

Ensure Certificate of Conformity is attached

*16899**12-05-3*

170

Receive & Inspect for Damage & Mat'l Certs

0.00

170

Packaging

Memo

0.00

Packaging

Ensure certificate of conformaty is attached

1649/7

W/O:		WORK ORDER CHANGES					
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Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180	QC6- Inspect dimensions to drawing	0.00							
180									
QC	Memo	0.00							
Quality Control									
190	Packaging	0.00							
190									
Packaging	Memo	0.00							
Packaging	Identify and stock in kanban rack								
	Location: <u>46</u>								
200	QC21- Final Inspection - Work Order Release	0.00							
200									
QC	Memo	0.00							
Quality Control									

RP 73809 SP

DP

12-6-7

12/6/26

MF 12-06-25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

April-16-12 2:29:06 PM

Page 1

Work Order ID: 83285

83285

Parent Item: D350-748-241TRN

D350-748-241TRN

Parent Item Name: Crosstube Turning Detail

Start Date: 16/04/2012

Required Date: 30/04/2012

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 08-03-06 DD verified by:ec
 IPP Rev B Removed polish 08.04.02 EC verified by : DD
 IPP Rev C Removed LPS-3 08.06.23 Ec verified by: DD IPP Rev D
 11.02.24 as per dwg rev.F DD verf: JLM

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6015-125		Manufactured	No			120	Each	44.0000	1	1			

D6015-125

Crosstube Material

**

Location

Loc Qty

Loc Code

HALL

44

61380

4

72511

40

32913

1

KC 12-4-20

use D6018-125

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	83285
Description: Crosstube Assembly (AS350/355 High Aft)		Part Number:	D350-748-241
Inspection Dwg: D350-748-241 Rev: F		Page 1 of 1	

FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.241	/	vern	CWC-08
	2.180	+0.005/-0.000	2.185	/		
	2.180	+0.005/-0.000	2.185	/		
	2.208	+0.005/-0.000	2.213	/		
	2.234	+0.005/-0.000	2.238	/		
	2.253	+0.005/-0.000	2.255	/		
	2.272	+0.005/-0.000	2.277	/		
	2.299	+0.005/-0.000	2.299	/		
	0.063	+/-0.010	.063	/	vern	CWC-08
	4.26	+/-0.030	4.26	/	"	
	R0.063	+/-0.010	.063	/	RG	
	R0.50	+/-0.030	.500	/	"	
SIDE B	2.240	+0.005/-0.000	2.240	/	vern	CWC-08
	2.180	+0.005/-0.000	2.184	/		
	2.180	+0.005/-0.000	2.182	/		
	2.208	+0.005/-0.000	2.210	/		
	2.234	+0.005/-0.000	2.234	/		
	2.253	+0.005/-0.000	2.253	/		
	2.272	+0.005/-0.000	2.277	/		
	2.299	+0.005/-0.000	2.299	/		
	0.063	+/-0.010	.063	/	vern	CWC-08
	4.26	+/-0.030	4.26	/	"	
	R0.063	+/-0.010	.063	/	RG	
	R0.50	+/-0.030	.500	/	"	
	122.70	+/-0.060	122.70	/	tape	MAN-L-02

Measured by: G.M.L.	Audited by: DP	Preliminary Approval:
Date: 12/04/21	Date: 12-5-23	Date:

Rev	Date	Change	Revised by	Approved
A	07.01.17	New Issue (P/O D350-748-201)	KJ/JLM	
B	12.02.02	Dwg Rev updated	KJ	

W/O:		WORK ORDER CHANGES					
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

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Item	Qty -241	Part Number	Description
1	X	D350-748-241	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
2	1	D6015-125	CROSSTUBE (OR D6018-125)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6018-125
FINISHED LENGTH = 122.700±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-241" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 29.85 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) RUN CUTTER OFF PART WHERE INDICATED. BLEND OUT ALL EDGES FROM MACHINING
LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER
BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER

NO. 83285 MLO
12/04/16

RELEASED
2011-01-08
JMP

F	ADD HRC TEST OPTION (88-1) PER PAR 08-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A8-3); ADD TOLERANCES (ZN C6-3, D2-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6018-125 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	DP	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	DP		
CHECKED	h	DRAWING NO.	REV. F
MFG. APPR.	E	D350-748-241	SHEET 1 OF 4
APPROVED	h	TITLE	SCALE
DE APPR.	h	CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR REPRODUCED IN ANY FORM OR BY ANY MEANS WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD</small>	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

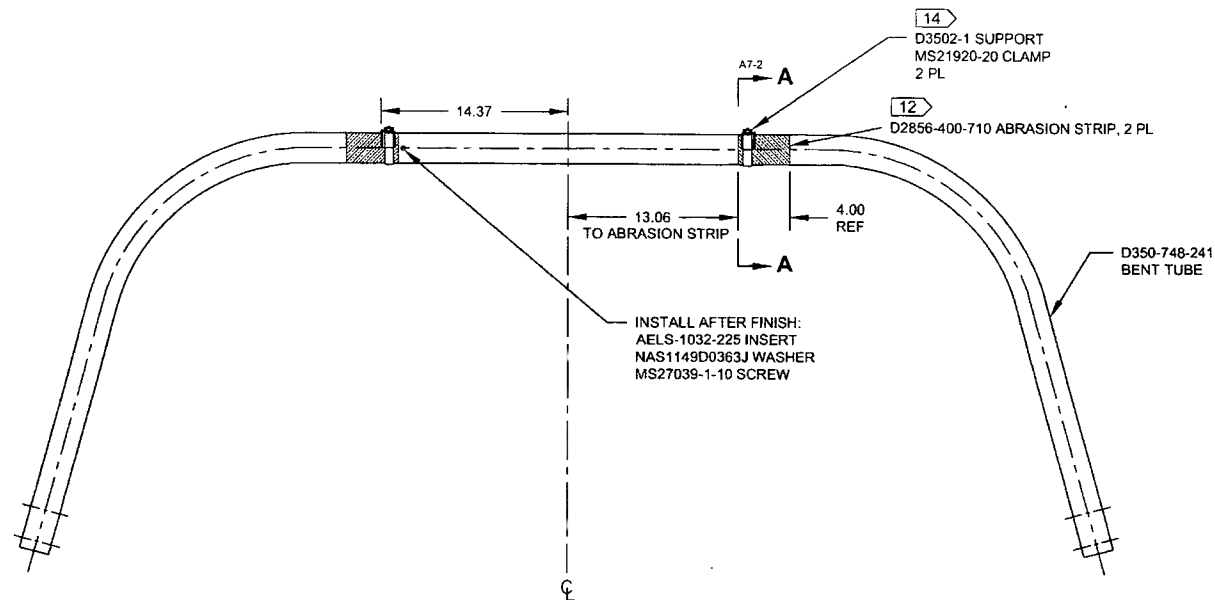
Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

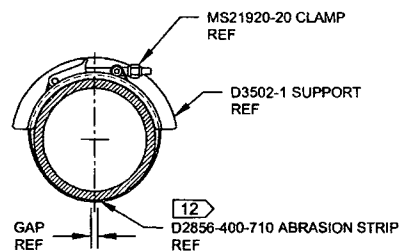
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83285



**D350-748-241
ASSEMBLY DETAIL**



SECTION A-A
D4-2
SCALE 4X

RELEASED
2011-02-19
JMP

DESIGN	9P	DART AEROSPACE LTD	
DRAWN	9P	HAWKESBURY, ONTARIO, CANADA	
CHECKED	B	DRAWING NO.	REV. F
MFG. APPR.	E	D350-748-241	SHEET 2 OF 4
APPROVED	JH	TITLE	SCALE
DE APPR.	JH	CROSSTUBE (AS 350/355 HI AFT)	NTS
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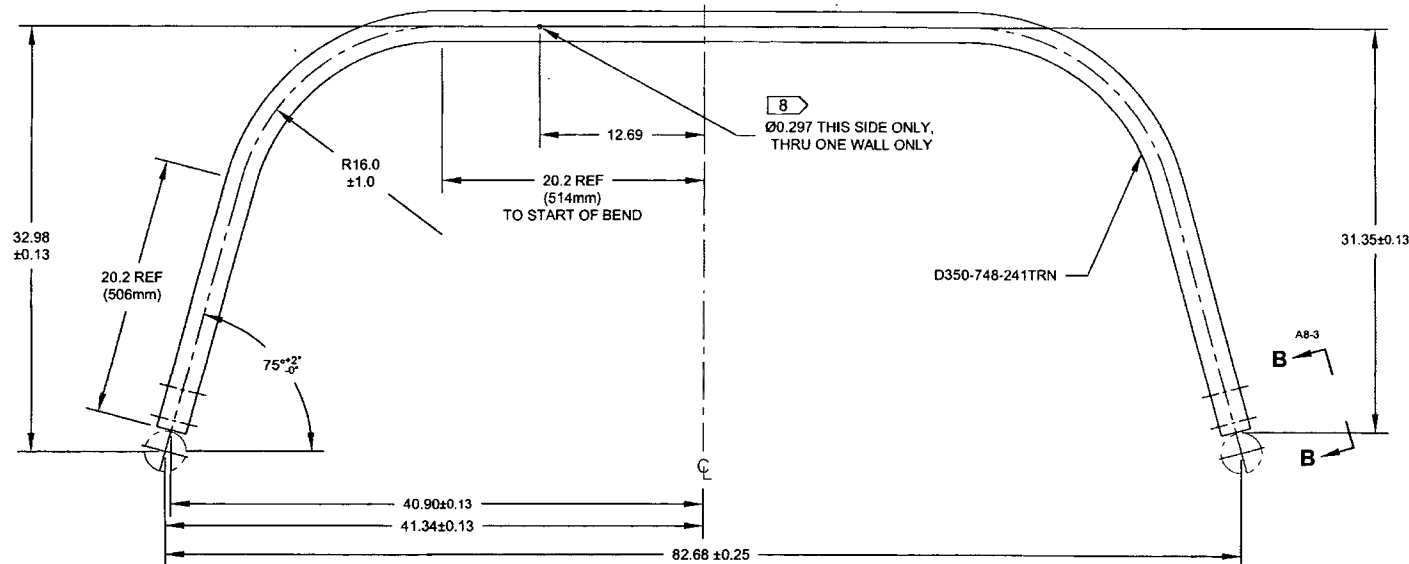
8 7 6 5 4 3 2 1

D

C

B

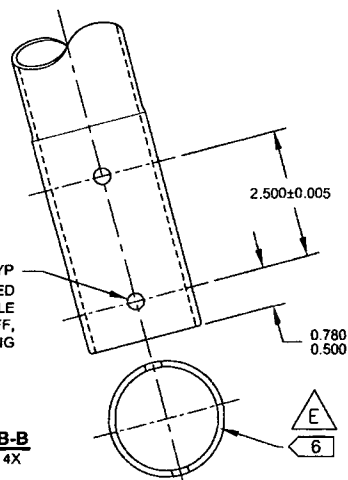
A



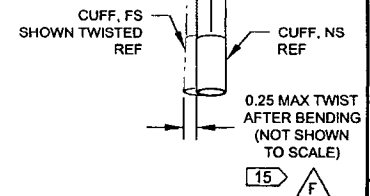
D350-748-241
BENDING AND DRILLING DETAIL 10

Ø0.323^{+0.005}_{-0.000} THRU, TYP
HOLE TO BE ALIGNED
WITHIN ±0.001 OF HOLE
ON OTHER SIDE OF CUFF,
TO BE DRILLED AFTER BENDING

C2-3 **VIEW B-B**
SCALE 4X



0.328



RELEASED
2011-01-18

DESIGN		DART AEROSPACE LTD	
DRAWN		HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. F
MFG. APPR.		D350-748-241	SHEET 3 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PROPRIETARY AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD</small>	

8 7 6 5 4 3 2 1

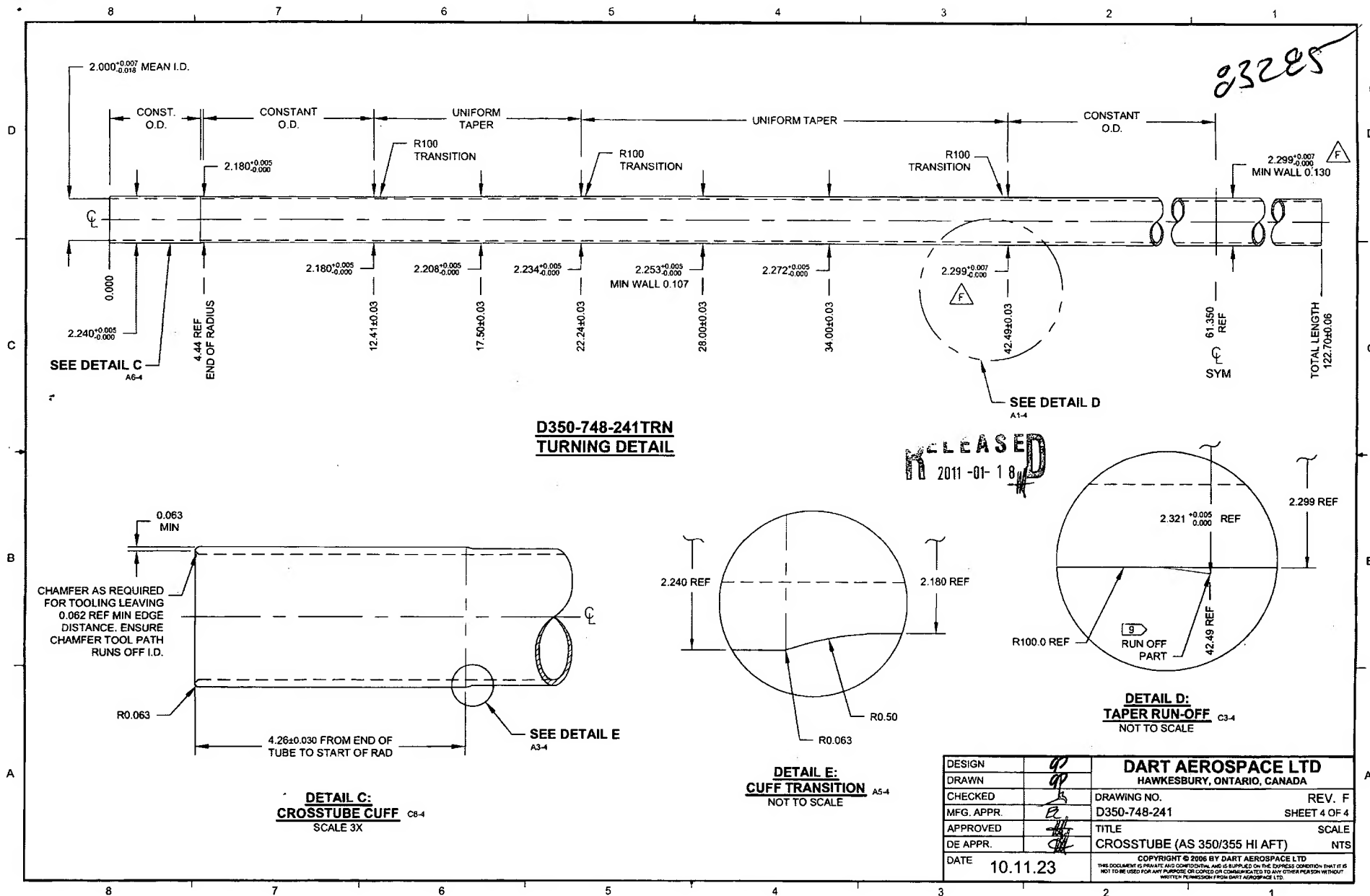
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NOTE: Date & initial all entries

Linda Lacelle

From: David Shepherd <dshepherd@dartaero.com>
Sent: March-08-12 11:58 PM
To: 'Linda Lacelle'; 'Provencal, Chris'
Cc: 'Pat Smith'; 'Bill Beckett'; 'Mike Petsche'
Subject: RE: 350 crosstube extrusion

Linda,

Not sure if you heard back from anyone on this, but this makes sense to me.

David

From: Linda Lacelle [<mailto:llacelle@dartaero.com>]
Sent: March-07-12 7:11 AM
To: dshepherd@dartaero.com; Provencal, Chris
Cc: Pat Smith; Bill Beckett; 'Mike Petsche'
Subject: RE: 350 crosstube extrusion

So just to confirm, we can use the old D6018-125's for the afts to deplete this stock?

Thx
Linda

From: Linda Lacelle [<mailto:llacelle@dartaero.com>]
Sent: March-06-12 10:19 AM
To: dshepherd@dartaero.com; Bill Beckett (bbeckett@dartaero.com); 'Mike Petsche' (mpetsche@dartaero.com); Provencal, Chris
Cc: Pat Smith (psmith@dartaero.com)
Subject: 350 crosstubes

Not sure who direct these ones to:

- 1) We will be finished drilling the last crosstubes shortly, these 7 & 7 will ship today for heat treating. Do we wait before drilling the balance until we receive the first shipment back, or continue on drilling? We probably won't see these first ones back for a couple of weeks, but I'd like to make sure we don't wait until the last minute.
- 2) We currently have 44pcs of D6015-125 in stock, this extrusion does both the fwd and aft 350 crosstubes. We also still have 38pcs of D6018-125, which does the aft 350 crosstubes. Should we place an order now to order more D6015-125? Can we use up the balance of the D6018-125's until depleted for all the next afts and use the D6015-125 for the fwds only?

Thank You,
Linda Lacelle
Production Manager
Dart Aerospace Ltd
Hawkesbury, ON
Phone: 613 632 9577
Fax: 613 632 1053
Cell: 613 676 1655



1000 E. Mermaid La., Wyndmoor (Phila.) PA 19038-8093
Tel. (215) 233-2600 Fax (215) 233-5653

Certification

SOLD TO

Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, ON K6A 1K7

June 5, 2012

Metlab Shop Order No:	72197
Purchase Order:	16899
Description:	Crosstube
Part No.:	D350-748-141TRN, D350-748-241TRN
Quantity:	7 and 4 Pieces, Respectively
Weight:	500 Pounds
Material:	4130 Alloy Steel
Specifications:	Heat Treat to Minimum 180 KSI (MIL-T-6736OR AMS 2759-IC)
Note:	Need HRC 40 - 45

This is to certify that the above parts were processed as indicated above and conform to the specification requirements.

Results:

HRC 45 (218 KSI Tensile Strength, Converted)

METLAB

Quality Representative

Mark Podob

MERCURY CONTAMINATION: During the heat treating process, testing and inspections, the product did not come in direct contact with mercury or any of its compounds nor with any mercury containing device.



Heat Treating and Metallurgical Consulting